HAVERSTRAW BAY ROUTE

The FERC certificated route crosses the Hudson River at Haverstraw Bay. This crossing location was dictated by (1) the location on the western shore of the Hudson River of the existing pipeline to be incorporated into the Millennium Project, (2) site-specific environmental considerations regarding feasible Hudson River crossing locations, and (3) the New York City markets to be served. These considerations shaped the route as follows:

- The Millennium Project has been designed to maximize the use of existing ROW associated with pipeline facilities owned by one of the Millennium partners and existing natural gas pipelines that will become part of the Millennium system. In Rockland County, the project will incorporate an existing pipeline from the western shore of the Hudson River at the Bowline Generating Station to a point approximately 10.9 miles west of that location. From that point westward, approximately 222 miles of the Columbia Gas Transmission Corporation's existing A-5 pipeline will be replaced with a new 36-inch pipeline.

- The Bowline Station property contains an ideal staging area for a crossing of the river, whereas investigations of other potential crossing locations for several miles upstream and downstream showed no feasible alternatives.

- The proposed landfall on the eastern shore of the Hudson River provides a suitable construction staging area while avoiding populated areas. Other potential crossing locations upstream and downstream on the eastern shore of the river were found to be unsuitable.

- The proposed route through Westchester County to the pipeline's terminus takes advantage of existing utility ROW corridor, permits New York City markets to be served, and was approved by the FERC after careful consideration of many potential alternatives.

In initially planning its pipeline route, Millennium recognized the sensitivity of crossing the Hudson River and therefore investigated several crossing locations upstream and downstream where a directionally-drilled crossing might conceivably be feasible or where environmental impacts otherwise could be reduced. In the spring of 1997, Millennium assembled a team of construction, engineering, and environmental experts to study potential Hudson River crossing locations. This process included an exhaustive review of topographic maps, aerial photography and dozens of site visits along a 17-mile stretch of the river from Stony Point, NY, south to the Tennessee Gas Pipeline crossing through Piermont Marsh, which is typical of the type of practice associated with siting a major interstate natural gas pipeline. Despite this effort, no feasible alternatives to the Haverstraw Bay crossing location were identified. The principal constraint at other sites was an inadequate on-shore staging area on both banks of the river. Other constraints were identified that prevented access routes to many of the locations studied.

Any pipeline crossing of a large river like the Hudson requires, first and foremost, adequate on-shore staging areas on both banks. These staging areas are necessary to store and position

equipment, pipe, and excavated material. The necessary size and configuration of the staging areas, depending on the crossing length and construction method selected vary as follows:

- For a horizontally directionally drilled (HDD) crossing, approximately one level acre is required on each bank for the entry and exit holes and the setup of the equipment to complete the drilling and reaming. The entry and exit holes must be located to ensure sufficient depth of cover so that the drilling fluids, which are under pressure during the drilling operation, do not breach the bore and contaminate the water. Depending on site-specific topography and geology, the holes may thus need to be located a significant distance from the riverbank. Additionally, a strip of land at least 50 feet wide and at least as long as the distance between the entry and exit holes is required on the "pipe stringing" side. This staging area must be as straight as possible and in line with the crossing. This lengthy staging area is necessary to fabricate one long pipe string, which is pulled into the entry hole after the proper reamed diameter is achieved for the entire crossing. However, in this instance the absence of adequate staging is only one of the constraints to a HDD crossing. HDD installations are further discussed later in this report.

- A conventional open-cut, bottom-pull river crossing requires a large staging area on one bank of the river and a smaller area on the other side. Unlike a directionally drilled crossing, the pipe string need not be one continuous piece, but the pipe pull can be accomplished more readily if the welded sections are at least 1,000 feet long. The required pipe staging area for such a crossing is approximately six level acres on one bank of the river (preferably 1,100 feet long and 240 feet wide), while approximately one-half acre of level ground is required on the other bank for the winch side of the pull.

- A lay-barge crossing, like that proposed by Millennium for the Hudson River, requires much less bank disturbance, since most of the staging and work areas are on barges in the river. Nevertheless, an area of approximately one-half acre is required on each bank of the river to make the shore approaches.

Given the location near the western shore of the Hudson River of the existing pipeline to be incorporated into the Millennium Project, the availability of a single feasible Hudson River crossing on both banks of the river at that point, and the Project's principal purpose of serving New York City markets, the crossing of the Hudson River, as proposed, was necessary to achieve the Project's goals. After extensive study, FERC certificated the proposed Haverstraw Bay crossing location.